INSTRUCTION MANUAL

NO. 5928

BARBER COLMAN

Combustion Safeguards

model 1574
FLAME-OTROL

EFFECTIVE FOR MODELS STARTING WITH
SERIAL NO. 06G0001

BARBER-COLMAN COMPANY
Industrial Instruments Division • Rockford, Ill., U.S.A.

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MODEL 1271-1
FLAME EYE

CSA UL AND FM APPROVAL

GENERAL

The Model 1574 Flame-otrol uses the Model 1271 Lead Sulphide Flame Eye Assembly. The photo-conductive lead-sulphide cell predominantly sensitive to infra-red energy, is used as a flame "pick-up". The Flame Eye is arranged so that it can be used as a straight type unit, MODEL 1271, or as an angle type MODEL 1271-1.

DESCRIPTION

The Model 1574 Automatic Flame-otrol provides flame failure protection and sequence timing for industrial and commercial burner systems. These may be gas, oil, or combination gas-oil fired burners.

Chassis is plug-in type and can be removed by applying pressure to captive latches. Programming includes purging, pilot proving, low fire starting, ignition timing, and post purging. Relay and timer assembly contacts are visible and accessible at any point in the timing sequence.

Safe start component check occurs whenever the control is initially powered, or upon reclosing of an opened limit control. Pull in of Flame Relay by fire in combustion chamber, or component failure prior to burner start up will cause control to lockout on safety, when

low voltage operating control is used. When line voltage operating control is used, pull-in of Flame Relay by fire in combustion chamber, or component failure prior to burner start up, will prevent pull-in of Safe-Start Relay, and will cause control to lockout on safety.

Failure of piloted ignition during start up will prevent energizing of main fuel valve, and will cause lockout. Failure to lightoff during 10 second period of unsupervised direct spark ignition will de-energize fuel valve and cause lockout. Flame failure during operating cycle will cause fuel valve to be de-energized in 2 to 4 seconds and control to lockout.

Terminals are provided for connection of Limit controls, Operating controls, Low Fire Start interlock, Modulation Control Motor, and Audible or Visual Alarm signal.

Provisions for separate viewing of Pilot Flame are included in Model 1574. Pilot Flame Eye is removed from circuit at end of 15 second ignition trial timing.

SPECIFICATIONS

Model 1574 Flame-otrol using Model 1271 Flame Eye (Straight) or Model 1271-1 Flame Eye (Angle Type).

Voltage and Frequency: Universal 120-240 volts, 50/60 cycles.
Also available 120-208 volts, 50/60 cycles (Must be specified).

Power Consumption: 35 VA.

Contact ratings:

Terminal

4—Alarm 125 V.A. Pilot Duty

5—Main Fuel Valve 125 V.A. Pilot Duty

6—Ignition-Oil 250 V.A. Ignition and/or 125 V.A. Pilot Duty

7—Ignition-Gas 250 V.A. Ignition and/or 125 V.A. Pilot Duty

8—Direct Ignition-Oil Valve 250 V.A. and/or 125 V.A. Pilot Duty

9—Burner Motor (Rating in Amperes)

Voltage	Full Load	Locked Rotor
120	5.2	31.2
208	3.0	18.0
240	2.6	15.6

10—Blower Motor—125 V.A. Pilot Duty
14-15-16—Modulator Motor Control 125 V.A. Pilot Duty

Maximum Ambient Temperature:
1574 Flame-otrol 125°F.
1271 Flame Eye 125°F.

Sequence Timing:
Prepurge—30 seconds
Pilot Proving—10 seconds
Ignition Timing (Interrupted)—15 seconds gas, 55 seconds oil (adjustable 5 to 55)
Modulating Motor released from Low Fire Position at 45 seconds. (End of Pilot Proving period)
Post Purge—15 seconds normal. 45 seconds on flame failure
Flame Failure Response: 2 to 4 seconds
Lockout Safety Switch: Nominal 30 seconds
Shipping Weight: 24 lbs.
Vacuum Tube: One (1) 6SN7 } should be replaced annually
Two (2) 6SL7 }

INSTALLATION OF 1574 FLAME-OTROL

Insert proper Line Voltage Selector Plug for power supply voltage to be used. Depress captive latches and remove chassis from case.

Refer to Fig. (A) for mounting dimensions. Model 1574 case should be mounted vertically in a panel or to a wall. Location selected should not exceed Maximum Ambient Temperature Limit of 125°F.

Six conduit knockouts are located in the left side of the cabinet. Bottom knockout should be used for conduit containing only Flame Eye wiring. **Wiring of Flame Eye only should be installed in separate conduit between case and Flame Eye.** Conduit bonding should be maintained between 1574 case and 1271 Flame Eye. This wiring should have a moisture resistant or plastic type insulation and should not be smaller than size #18. Wire having cotton, asbestos or similar type insulation should not be used.

If Model 1574 is mounted inside a control panel, shielded cable should be used from control case to terminals for external wiring of Flame Eyes. Flame Eye wiring should be separated from other external wiring from point of entry into control panel to terminal

strips for external wiring of Flame Eyes. **(Do not run unshielded Flame Eye wiring in the same channel, trough, or laced harness with power or control wiring.)**

Power wiring should not be under size #14 and should be carried in rigid or flexible conduit. All wiring connections should be made directly to the terminal strip provided at the left side of case. All wiring should conform to National Electric Code and local codes or ordinances which apply.

INSTALLATION OF FLAME EYE SCANNER

Model 1271 Flame Eye should be installed as per burner manufacturers recommendations. If such information is not available, Flame Eye should be installed onto a ¾" black iron pipe threaded to receive #6-103 plastic insulating nipple. See Fig. (B). Opposite end of #6-103 has ¾" thread to receive threaded collar of Flame Eye. The #6-103 plastic insulating nipple will eliminate problems of conducted heat from black iron nipple.

The sighting nipple should not be extended more than halfway through the refractory wall and should be installed in such a manner so that the background viewed in combustion chamber is relatively dark. The lead sulphide type Flame Eye operates on an infra-red radiation of a flame which has a pulsating or fluctuating nature. These pulsations or fluctuations are in the nature of a "flicker" at a frequency to which control operation is designed. Heated refractory surfaces also radiate an infra-red wave but it is steady and does not flicker as that radiated by the flame. The refractory radiation will not in itself actuate the flame relay of the control through the electronic network as the radiation from a flame. However, the refractory radiation within a chamber can be caused to flicker by air movements or steam, (in the case of steam atomizing type oil burners) and cause false hold in after the flame of the burner has gone out.

Another condition which can occur from refractory radiation is one in which the signal from very hot refractory overwhelms the signal from the flame and causes the Flame Eye to become blinded and control shutdown occurs. This can be compared to looking at a lighted match in your hand with your back to the sun, and then turning around into the rays of the sun with the lighted match. The sun overwhelms the flame from the match to the point where

not even the hand is visible. This is a similarity between a lead sulphide cell and the human eye. In this respect the sighting tube should be installed to sight into the dark or coolest background of the combustion chamber.

In cases where high radiation backgrounds are present, orificing may be necessary to reduce the viewed background and eliminate the undesirable refractory signal. Orificing may also be used as a means of setting the opening to the Flame Eye so that it will be the proper size when actual flame signal is present, but will not receive sufficient signal through this size opening when air or steam is causing a "flicker" in the refractory radiation.

If hot gases reach Flame Eye due to pressure in combustion chamber, or from down drafts of stack between burner operating cycles, A-3561 — Orificing-Sealing Assembly should be used. See Fig. (B). Temperature at Flame Eye should not exceed 125°F as temperatures above this point will reduce sensitivity of lead sulphide cell. When heat condition is being caused by radiated heat from burner or boiler front, increase length of black iron pipe nipple. In the event the required additional length of pipe is impractical, cooling air should be applied through opening provided in #6-103 plastic insulating nipple for accommodation of $\frac{1}{8}$" tubing fitting. (Opening is sized for $\frac{1}{8}$" N. P. Tap).

Flame Eye alignment for interrupted pilot ignition should be set so that the pilot flame is viewed at the point where ignition of main flame should occur. See Fig. (C). This will allow Flame Eye to prove pilot flame and after ignition trial period is completed, it will supervise main flame. This requires only one Flame Eye which is connected at Terminals E_m and G.

When using an intermittent pilot, one Flame Eye is used for viewing the pilot at the point where ignition of main flame should occur, and a second Flame Eye is used to view the main flame at a point where it cannot see the pilot flame. See Fig. (D). The pilot Flame Eye is connected at Terminals E_p and G and is removed from the circuit at the normal end of the ignition trial period. The Flame Eye viewing the main flame is connected at Terminals E_m and G and supervises the main flame only after the pilot Flame Eye is removed from the circuit at the end of the ignition trial period.

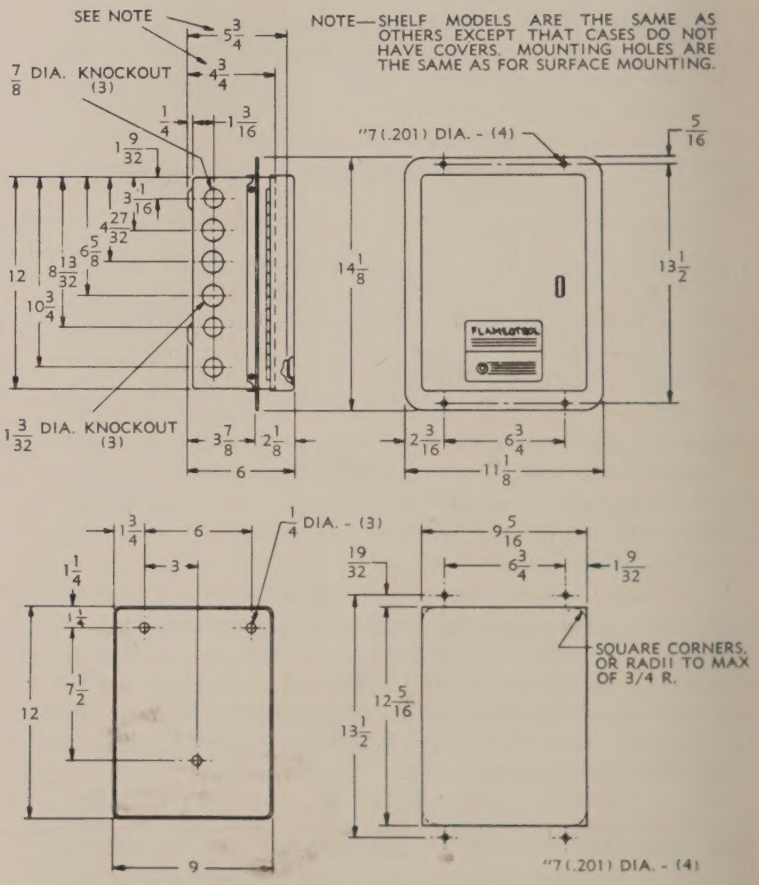
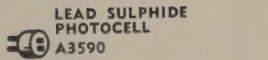
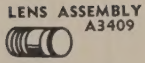
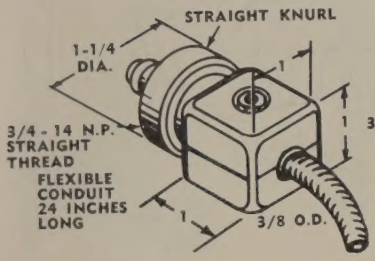

SEE NOTE
NOTE—SHELF MODELS ARE THE SAME AS OTHERS EXCEPT THAT CASES DO NOT HAVE COVERS. MOUNTING HOLES ARE THE SAME AS FOR SURFACE MOUNTING.
7/8 DIA. KNOCKOUT (3)
5 3/4
4 3/4
1/4
1 3/16
1 9/32
3 1/16
4 27/32
6 5/8
8 13/32
10 3/4
12
1 3/32 DIA. KNOCKOUT (3)
3 7/8
2 1/8
6
.7 (.201) DIA. - (4)
5/16
14 1/8
13 1/2
2 3/16
6 3/4
11 1/8
1 3/4
6
1/4 DIA. - (3)
1 1/4
3
1 1/4
7 1/2
12
9
9 5/16
19/32
6 3/4
1 9/32
SQUARE CORNERS, OR RADII TO MAX OF 3/4 R.
12 5/16
13 1/2
.7 (.201) DIA. - (4)
SURFACE MOUNTING (HOLE PATTERN IN RELATION TO CASE OUTLINE)
PANEL CUTOUT FOR FLUSH MOUNTING

FIG. A

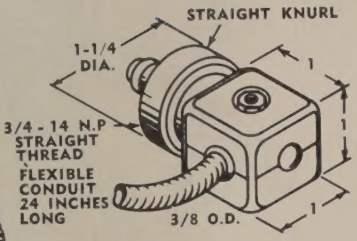




MODEL 1271—STRAIGHT
INCLUDES A3590 & A3409



MODEL 1271-1
FLAME-EYE—ANGLE



INSULATING-ORIFICING ASSEMBLY FOR USE WITH FLAME-EYE MODELS 1271 AND 1271-1

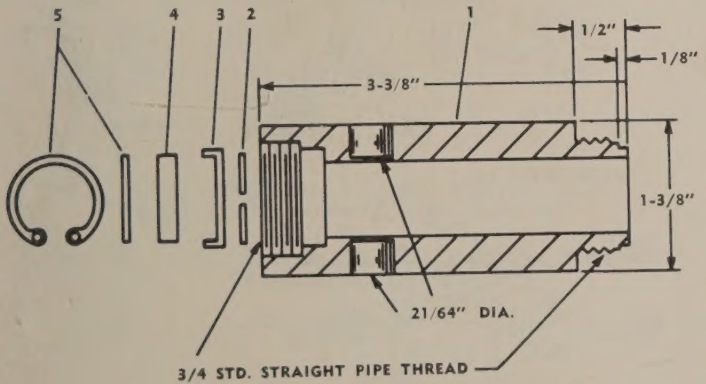


FIG. B

1. 6-103 Heat Resistant Insulating Nipple (Molded).
2. 13-1127 A, B, C, D (Blank, 1/32", 1/16", 1/8") Orifice (Aluminum)
3. Window Frame (Aluminum).
4. Window Glass (Pyrex).
5. Snap Ring.

} A-3650

NOTE: A. Above items (1 each) packed in box — Specify assembly A3651.
B. 21/64" blind holes may be opened. Tap for 1/8" N.P.T. air connection.

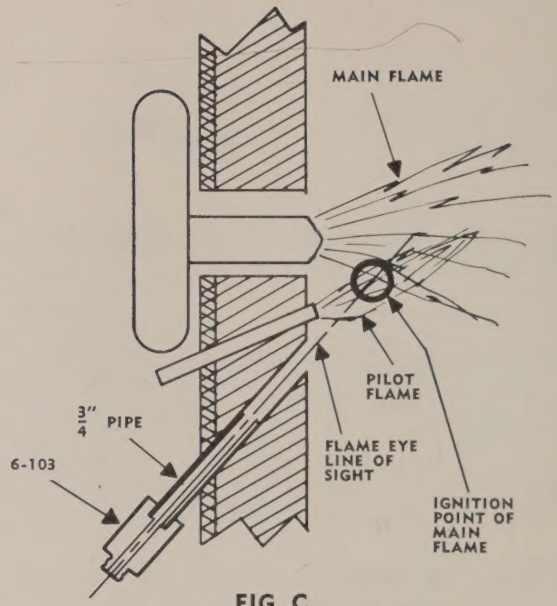


FIG. C
(Sectional Side View)

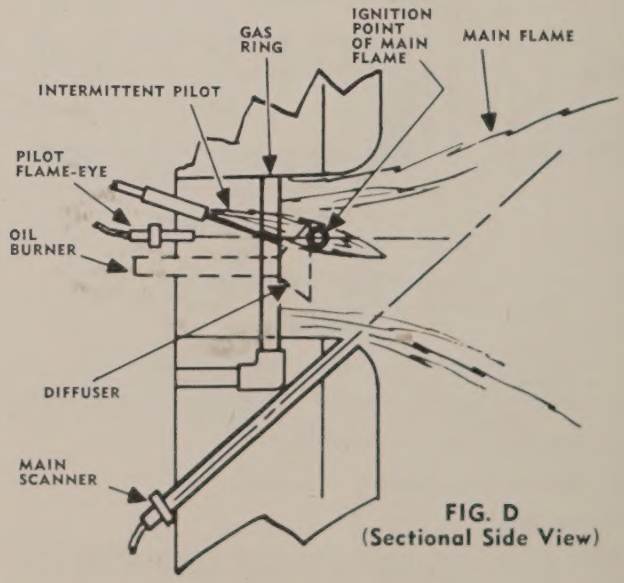
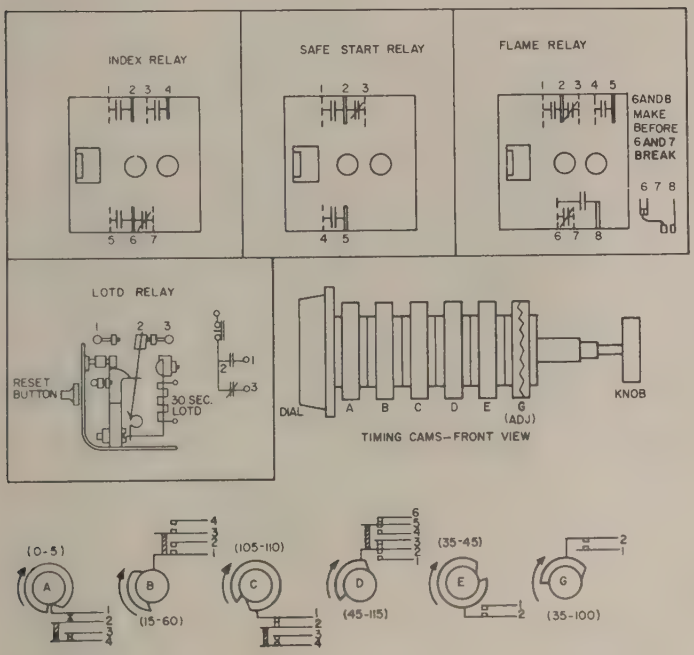


FIG. D
(Sectional Side View)

FLAME-OTROL RELAYS AND TIMER CONTACTS



CONTACTS SHOWN IN "ZERO" POSITION OF TIMING CYCLE (VIEWED FROM KNOB END)

NOTE: THIS DIAGRAM APPLIES TO ALL UNITS STARTING WITH SERIAL NUMBER 06G0001

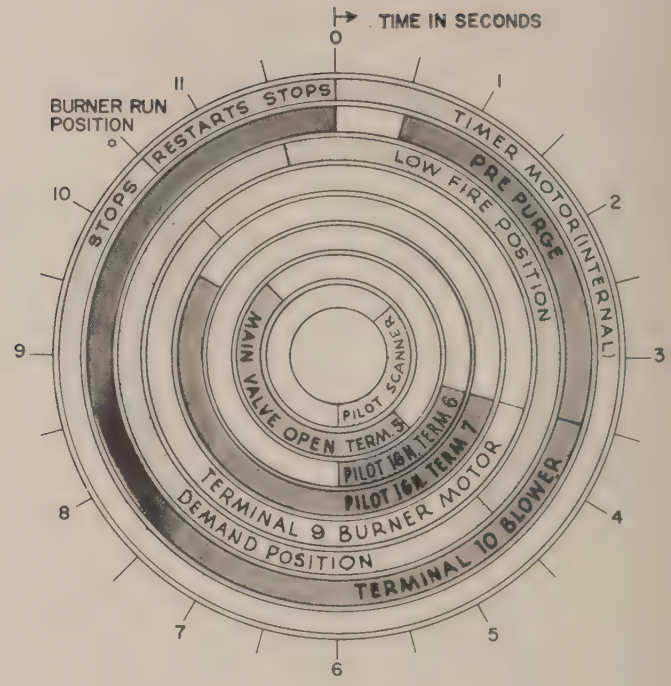


FIG. E

NOTE: THIS DIAGRAM APPLIES TO ALL UNITS STARTING WITH SERIAL NUMBER 58C0100

Piloted Ignition Timer Motor stops at 105 seconds. Terminals 5, 9, and 10 stay powered.

When shutdown occurs, Timer Motor restarts, Blower Motor only stays powered to "O".

(Timer Dial numbered per 10 second intervals).

Programming Sequence of Model 157-I Flame-otrol using Piloted Ignition is shown above and described in Figure F. Terminal 7 is used for Pilot Ignition when firing Gas Main Fuel, and Terminal 6 is used when firing Oil Main Fuel. Terminal 6 is powered through contact on G cam which is adjustable. Trial for Ignition period of main fuel can be lowered from factory set maximum of 55 seconds to a minimum of 5 seconds. (Adjustment can be made in increments of 5 seconds.)

PILOTED IGNITION

TIMER DIAL	TIME FROM ZERO	INTERNAL SEQUENCE OF CONTACTS	EXTERNAL CIRCUITS
0	0	D4-5 open. D5-6 closed.	Modulating Motor in Low Fire position. Low Fire Switch closed between 12 and 13. Main Flame Scanner connected to Em and G and is in circuit at all times. Pilot Scanner connected to Ep and G.
0	0	A3-4 closed. Index Relay pulls in. I1-2, I3-4, I5-6 close. I6-7 opens. Timer Motor starts.	Low Voltage Operating Control closes between 11 and 12. (If Line Voltage Operating Control is used between L1 and 3, jumper Terminals 11 to 12.)
0 | 1	5	A1-2 closes. A3-4 opens.	Terminal 10 powered. Blower Motor starts. (Prepurge).
1 | 2	15	B1-2, B3-4 close.	Pilot Scanner circuit closed to Ep.
3 | 4	35	E1-2 closes. Safe Start Relay pulls in. SS1-2, SS4-5 close. SS2-3 opens. G1-2 closes. Flame Relay pulls in. F1-2, F4-5 close. F2-3 opens. F6-8 closes before F6-7 opens.	Terminal 9 powered. Burner Motor (if used) starts. Terminal 8, 7, and 6 powered. Pilot Valve and Ignition Transformer powered. Pilot Flame on.
4 | 5	45	E1-2 opens. (If Flame Relay did not pull in Safe Start Relay drops out.) D2-3 opens. D1-2 closes. D5-6 opens. D4-5 closes.	Terminal 5 powered. Main Fuel Valve opens if Flame Relay in. Modulating Motor now to Demand Position.
6	60	B1-2 opens. B3-4 opens.	Pilot Scanner circuit open at Ep. Terminal 7 de-energized (end of 15 sec. Trial For Ignition.) Pilot off if powered from 7.
10	100	G1-2 opens.	Terminal 6 de-energized. (End of 55 sec. Trial For Ignition.) Pilot off if powered from 6.
10 | 11	105	C3-4 closes. C1-2 opens. Timer Motor stops. Burner Run Position reached.	Terminals 10, 9, and 5 remain powered. Modulating Motor positioned by PP Controller.
RUN			
10 | 11	105	Index and Safe Start Relays drop out. SS1-2, SS4-5 open. SS2-3 closes. I1-2, I3-4, I5-6 open. I6-7 closes. Timer Motor restarts.	Operating Control or Limit Control opens. Terminals 9 and 5 de-energized. Burner Motor off. Main Fuel Valve de-energized. (Flame goes out and Flame Relay drops in 2 to 4 sec.)
11	110	C1-2 closes. C3-4 opens.	
11 | 0	115	D4-5 opens. D5-6 closes. D1-2 opens. D2-3 closes.	Modulating Motor to Low Fire Position.
0	120	A3-4 closes. A1-2 opens. Timer Motor stops.	Terminal 10 de-energized. Blower Motor off.

FIG. F

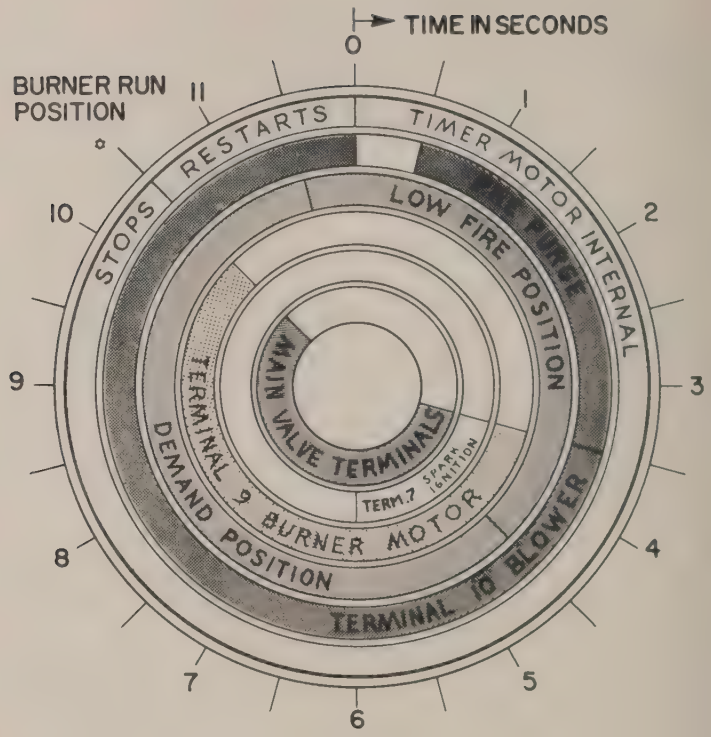


FIG. G

Direct Spark Ignition Timer Motor stops at 105 seconds, terminals 8, 9, and 10 stay powered.

When shutdown occurs, timer motor restarts, blower motor only stays powered to "O".

(Timer dial numbered for 10 second intervals.)

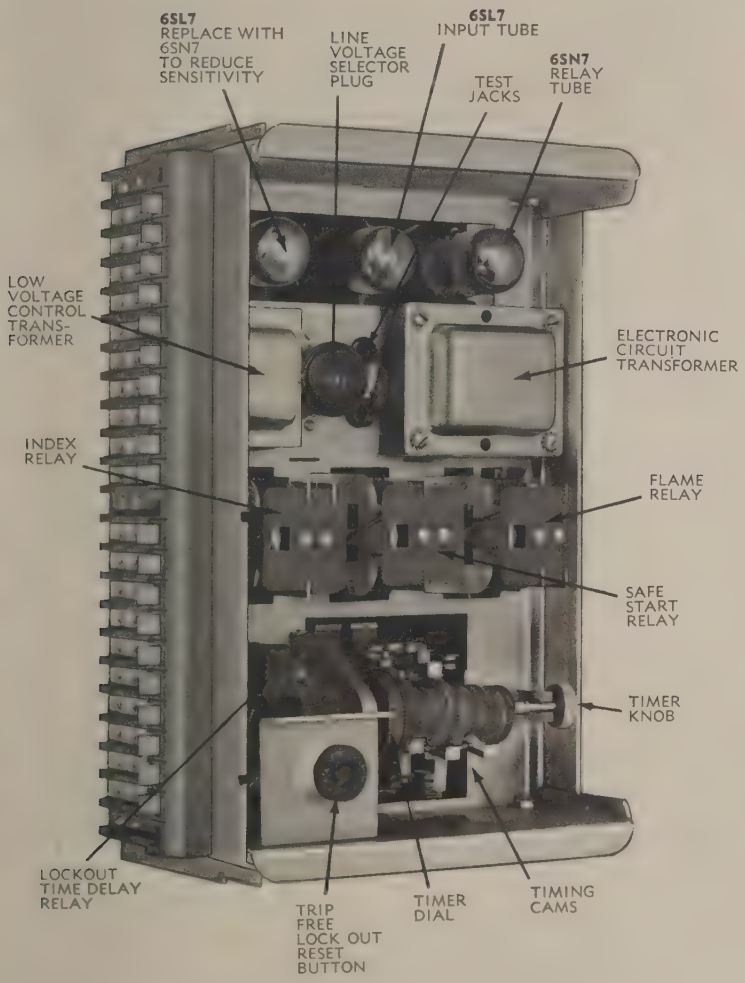
Flame must be established and detected between 35 and 45 second interval of program timer or oil valve will be de-energized. This allows only a 10 second period of unsupervised light off of fuel

DIRECT SPARK IGNITION

TIMER DIAL	TIME FROM ZERO	INTERNAL SEQUENCE OF CONTACTS	EXTERNAL CIRCUITS
0	0	D4-5 open. D5-6 closed.	Modulating Motor in Low Fire position. Low Fire Switch closed between 12 and 13.
0	0	A3-4 closed. Index Relay pulls in. I1-2, I3-4, I5-6 close. I6-7 opens. Timer Motor starts.	Low Voltage Operating Control closes between 11 and 12. (If Line Voltage Operating Control is used between L1 and 3, jumper Terminals 11 to 12.)
0 | 1	5	A1-2 closes. A3-4 opens.	Terminal 10 powered. Blower Motor starts. (Burner Motor if no Blower Motor used.) Prepurge starts.
1 | 2	15	B1-2, B3-4 close.	Pilot Scanner circuit closed to Ep.
3 | 4	35	E1-2 closes. Safe Start Relay pulls in. SS1-2, SS4-5 close. SS2-3 opens. G1-2 closes. Flame Relay pulls in. F1-2, F4-5 close. F2-3 opens. F6-8 closes before F6-7 opens.	Terminal 9 powered. Burner Motor starts. (If Blower Motor is used.) Terminal 8 powered. Main Fuel valve energized. Terminal 7 powered. Terminal 6 powered. (For 15 sec. Spark Ignition use Term. 7 for 55 Sec. Spark Ignition use Term. 6.) Main Flame on.
4 | 5	45	E1-2 opens. (If Flame Relay did not pull in Safe Start Relay drops out.) D2-3 opens. D1-2 closes. D5-6 opens. D4-5 closes.	(If Flame Relay did not pull in Safe Start Relay drops and SS4-5 de-energizes Term. 9, 8, 7, 6, and 5.) Modulating Motor to Demand Position.
6	60	B1-2 opens. B3-4 opens.	Pilot Scanner circuit open at Ep. Terminal 7 de-energized. (End of Spark Ignition if on Terminal 7.)
10	100	G1-2 opens.	Terminal 6 de-energized. (End of Spark Ignition if on Terminal 6.)
10 | 11	105	C3-4 closes. C1-2 opens. Timer Motor stops. Burner Run Position reached.	Terminals 10, 9, and 8 remain powered.
		RUN	
10 | 11	105	Index and Safe Start Relays drop out. SS1-2, SS4-5 open. SS2-3 closes. I1-2, I3-4, I5-6 open. I6-7 closes. Timer Motor restarts.	Operating Control or Limit Control opens. Terminals 9 and 8 de-energized. Burner Motor stops. Main Valve de-energized. (Flame goes out and Flame Relay drops out in 2 to 4 Sec.)
11	110	C1-2 closes. C3-4 opens.	
11 | 0	115	D4-5 opens. D5-6 closes. D1-2 opens. D2-3 closes.	Modulating Motor to Low Fire Position.
0	120	A3-4 closes. A1-2 opens. Timer Motor stops.	Terminal 10 de-energized. (Blower or Burner Motor off.)

FIG. H

INTERNAL CONTROL CIRCUITRY OF MODEL 1574 AND TYPICAL EXTERNAL COMPONENT CONNECTING POINTS.


6SL7
REPLACE WITH
6SN7
TO REDUCE
SENSITIVITY
LINE
VOLTAGE
SELECTOR
PLUG
6SL7
INPUT TUBE
TEST
JACKS
6SN7
RELAY
TUBE
LOW
VOLTAGE
CONTROL
TRANS-
FORMER
ELECTRONIC
CIRCUIT
TRANSFORMER
INDEX
RELAY
FLAME
RELAY
SAFE
START
RELAY
TIMER
KNOB
LOCKOUT
TIME DELAY
RELAY
TRIP
FREE
LOCK OUT
RESET
BUTTON
TIMER
DIAL
TIMING
CAMS

TESTING PROCEDURE

Before making any tests after installation is completed make sure that the Manual Shutoff Valve in the main fuel line upstream from the Main Fuel Valve or Valves is closed. In the event this valve cuts off fuel supply to the Pilot Solenoid Valve, it will have to be left open to supply pilot fuel. In this case it is recommended that the external wiring to the Main Fuel Valve be disconnected and kept clear until it is desired to try Main Fuel firing.

If Timer Dial is not at "O", manually turn knob to "O". Turn "On" power to control. If low fire start interlock on Modulation Control Motor is used, Timer Motor in control will not start until Modulation Control Motor has reached Low Fire Position and low fire start interlock closes.

Blower or Burner Motor will start at 5 second point of Timer cycle and begin 30 second prepurge period. At 35 second point of Timer, Piloted Ignition will be powered and if Pilot Flame lights Flame Relay will pull in. It will remain on until 60 or 100 second point depending on whether powered from Terminal 6 or 7. Pilot can be observed and adjusted if necessary during this time. If more time is needed for observation and adjustment, turn Timer beyond 105 second point and recycle will occur. (If Timer is not turned beyond the 105 point at which it stops, control will lockout.)

After Pilot Flame is properly adjusted, Main Fuel Valve can be reconnected, or Manual Shutoff Valve in main fuel line can be opened. (Turn off power to control or open up Limit Control circuit before reconnecting Main Fuel Valve or Valves.) When Power is turned on or Limit Control circuit is reclosed, start up cycle will begin. Main Burner should light at 45 second point and continue to operate after Timer reaches 105 point and stops.

A test plug may be used to power all parts of the control with the exception of the motor which drives the Timer assembly. When the test plug is inserted in place of the normal voltage selector plug, the Timer assembly knob may be manually rotated through a normal operation and stopped at any point at which pilot or main burner adjustments are to be made. This test plug part number is A-3803 for 115V., A-3804 for 208V., and A-3805 for 230V.

MINIMUM PILOT TEST

Turn "Off" power to control. Close Manual Shutoff Valve, or disconnect Main Fuel Valve in main fuel line. Test Plug should be inserted for normal Voltage Selector Plug. Turn "On" power to control. Manually rotate Timer Knob until Piloted Ignition is energized at 35 second point. Reduce size of Pilot Flame until Flame Relay drops out. (If D.C. Voltmeter is used—approximately 45 volts reading.)

Increase size of Pilot Flame until Flame Relay just pulls in. (Approx. 75 volts.) Turn Timer to "0" position, turn off power if wiring to Main Fuel Valve has been disconnected. (If Shutoff Valve had been used to keep main fuel line closed, previous step is unnecessary and may be omitted.) Reopen Shutoff Valve and SLOWLY turn Timer to 50 second position allowing some purge to occur, and Pilot Flame to light. Main Flame should light reliably from this size Pilot Flame. If it does not, the sighting of the Flame-Eye scanner must be rearranged so that the reduced pilot will reliably light the main burner. This means it will require a larger size Pilot Flame with the Flame-Eye sighting further out from the pilot burner at the end of the longer flame. Minimum Pilot test should be repeated after resighting Flame-Eye until reliable lightoff of main burner is accomplished. Re-adjust Pilot Flame to full size for extra margin for lightoff of main burner. Replace test plug with normal voltage selector plug.

PILOTED IGNITION FAILURE TEST

Turn off fuel to the pilot to prevent Pilot Flame from lighting. Turn "On" power to begin operating cycle. At 35 second point Pilot Solenoid and Ignition Transformer will be powered. Pilot Flame will not be established as fuel has been turned off. Flame Relay will not pull in as no flame was detected. Pilot Solenoid and Ignition Transformer will be de-energized at 45 second point and Main Fuel Valve will not be energized. Timer Motor will continue until 105 second point where it will stop and in approximately 30 seconds lockout relay will actuate to sound alarm and Timer Motor will index to "O" position and stop. Burner or Blower Motor will shut off.

MAIN FLAME FAILURE TEST

After achieving a normal start up of burner and Timer Motor has stopped at 105 second point, shut off Main Fuel. The Main Fuel Valve will de-energize in 2 to 4 seconds after flame goes out. Approximately 30 seconds later the control will go to lockout and Timer Motor will index to "O" position and stop. Burner Motor will shut off when Flame Relay is de-energized. Blower Motor will shut off at "O" position.

TEST FOR BLINDING OF FLAME EYE SCANNER

Allow the burner to fire at a high rate until any refractory in the chamber has reached its maximum temperature. At this point check reading at Test Jacks with D.C. Voltmeter to see if voltage is fairly steady and at least approximately 80 volts. If meter needle has occasional dips to approximately 70 volts or less, it may be caused by hot refractory background. Arrange to have someone hold in the Flame Relay while the Flame Eye Scanner is removed and an observation is made through the sighting tube to determine whether background is the cause. (There is also a possibility that the amount of flame being viewed at the end of the sighting tube is reduced giving a corresponding reduction in signal.) If either of the previously mentioned conditions are occurring, resighting of Flame Eye to cooler or lower temperature background, or maintaining flame over full area of sighting tube opening is necessary. This will eliminate nuisance shutdowns caused by these conditions during sustained periods of operation at high firing rates.

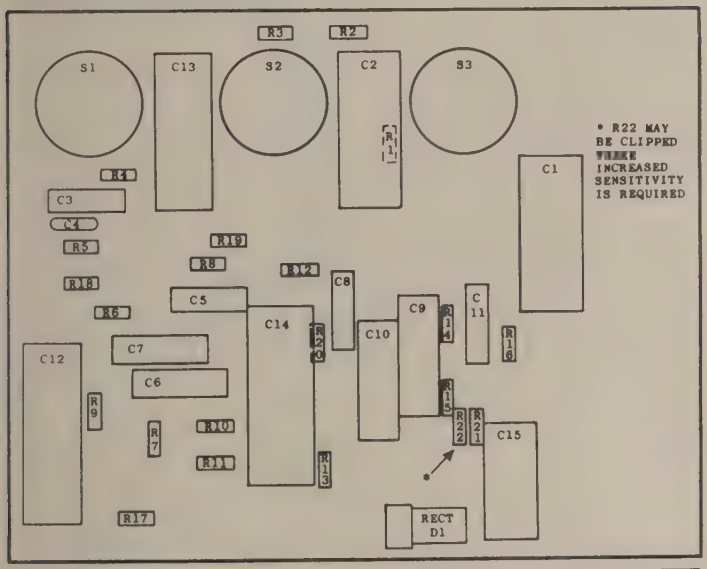
TEST FOR AIR OR STEAM MODULATION OF REFRACTORY SIGNAL

After making the previous test and determining that Flame Eye will not be blinded even though there may be bright refractory background, another test should be made. When refractory has reached maximum operating temperature, shut off main fuel supply. If Main Fuel Valve does not de-energize in 2 to 4 seconds after fuel has been shut off, there is possibly some modulation of the light from the background occurring. This could be caused by Blower Air currents in the case of Gas Fuel, or by atomizing steam in the case of Heavy Oil. To eliminate this condition requires the installation of an orifice in the sighting tube sized to hold the relay only when flame is present and not when air or steam only is entering the viewing area and modulating the signal from bright refractory.

If Test Plug was used during the previous test, it should be replaced with Voltage Selector Plug to put unit into operation.

"IR" INFRA-RED LEAD SULPHIDE SYSTEM
MODEL 1574 FLAME-OTROL PRINTED CIRCUIT BOARD

LAYOUT OF COMPONENTS

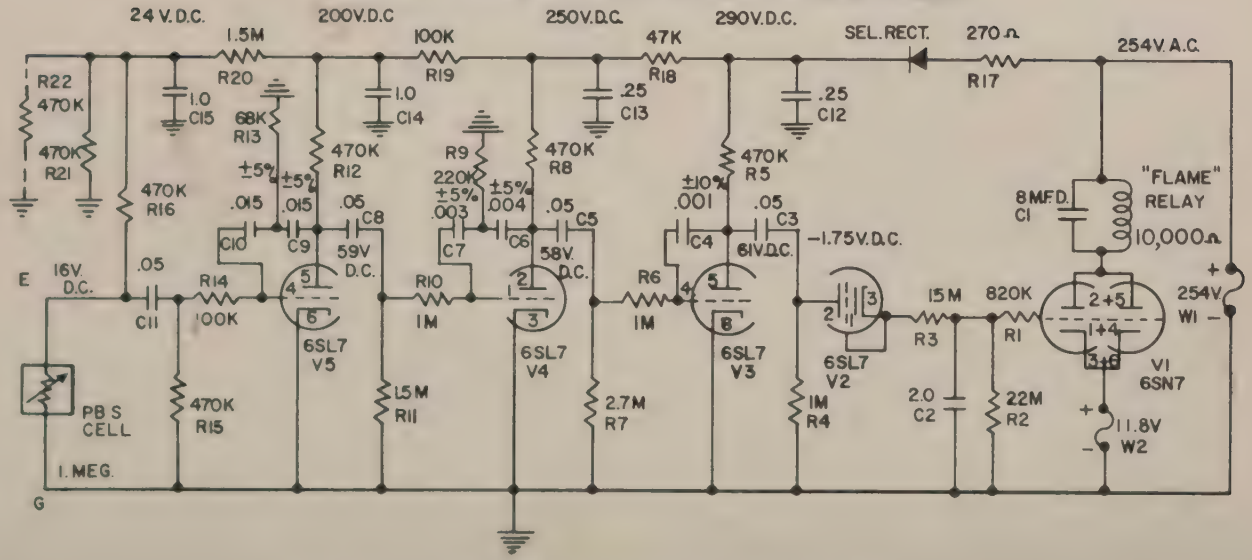


ORDERING NO.	DESCRIPTION
39-045-2	Condenser .25 MFD 400 V.D.C. C12, 13
39-071	Condenser .003 MFD 400 V.D.C. C7
39-072	Condenser .004 MFD 400 V.D.C. C6
39-077	Condenser 2 MFD 200 V.D.C. C2
39-083	Condenser .015 MFD 600 V.D.C. C9, 10
39-098	Condenser 1.0 MFD 200 V.D.C. C15
39-099	Condenser 1.0 MFD 400 V.D.C. C14
39-101-1	Condenser .05 MFD 400 V.D.C. C3, 5, 8, 11
39-102-1	Condenser .001 MFD 600 V.D.C. C4
CYZR-327-1	Condenser 8 MFD 250 V.D.C. C1
37-016	Selenium Rectifier D1
34-326	Tube Socket S1, 2, 3

ORDERING NO.	DESCRIPTION
40-019-1	Resistor 100K ½W ± 10% R14, 19
40-021	Resistor 1.5M 1.2W ± 10% R3, 11, 20
40-039	Resistor 22M ½W ± 10% R2
40-090-1	Resistor 820K ½W ± 5% R1
40-070-2	Resistor 47K 1W ± 10% R18
40-077	Resistor 270 ohm ½W ± 10% R17
40-109-1	Resistor 220K ½W ± 5% R9
40-110	Resistor 68K ½W ± 5% R13
40-111	Resistor 470K ½W ± 5% R5, 8, 12, 15, 16, 21, 22
CYZR-170-17	Resistor 2.7M ½W ± 10% R7
CYZR-170-41	Resistor 1M ½W ± 10% R4, 6, 10

THIS DIAGRAM APPLIES TO ALL UNITS STARTING WITH SERIAL NUMBER 06G0001

"IR" INFRA-RED LEAD SULPHIDE SYSTEM 1574 SERIES
FLAME-OTROL DETECTOR CIRCUIT INTERNAL WIRING DIAGRAM



THIS CIRCUIT APPLIES TO FLAME-OTROL MODEL 1574 USING A PRINTED CIRCUIT BOARD. ALL RESISTORS, CONDENSERS, TUBE SOCKETS, AND SELENIUM RECTIFIER MOUNTED ON BOARD.

GENERAL WIRING DIAGRAM NOTES

A typical diagram for an automatic gas fired burner with interrupted pilot and ignition is shown in Figure L. If interrupted monitoring of the pilot flame is desired, a pilot Flame Eye must be connected to terminals E_p and G.

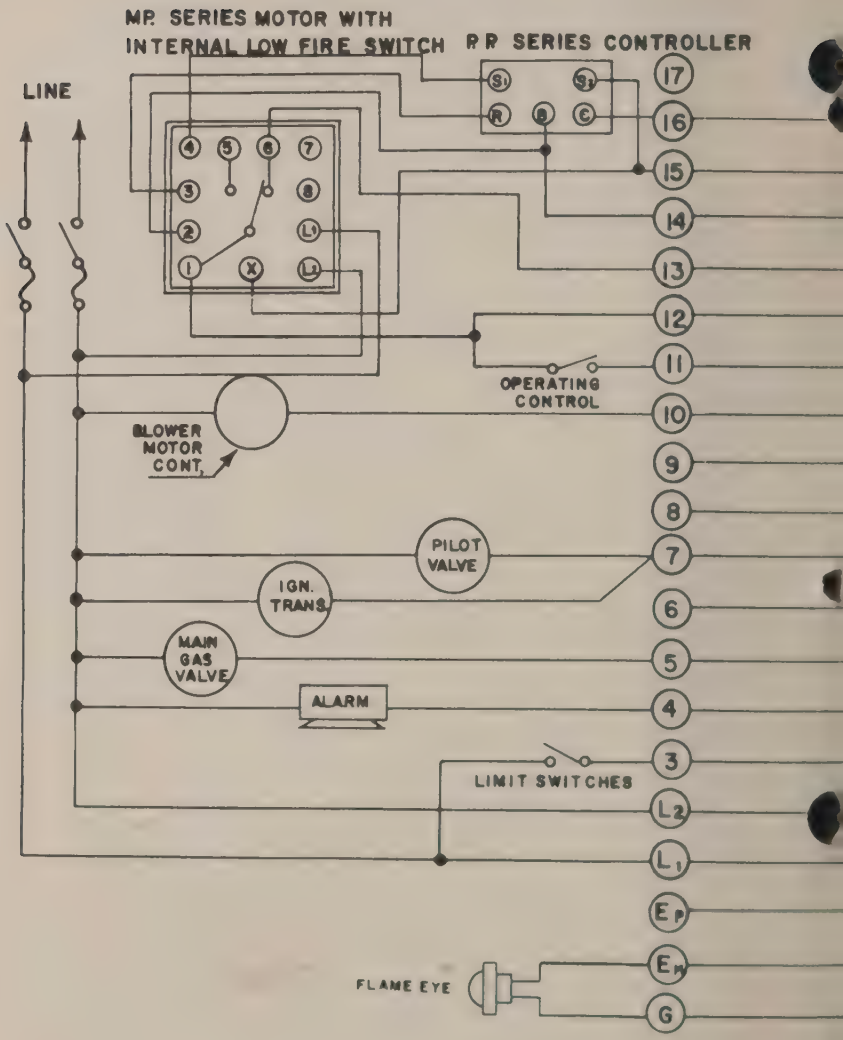
Figure M is a typical diagram for interrupted pilot and ignition on automatic heavy oil fired burner applications. For interrupted pilot flame monitoring, a pilot Flame Eye must be connected to terminals E_p and G, the same as described above for gas fired burners.

For dual fuel (Gas-Oil) burner applications with interrupted pilot and ignition, a typical diagram is shown in Figure N. Separate Flame Eyes are used for the main flames, determined by position of fuel selector switch, and a single Flame Eye is used for monitoring the interrupted pilot.

Figure O is a typical diagram for direct spark ignition on automatic light oil fired burner applications. (1) scanner required across terminals E_m and G.

Figure P is a typical diagram for intermittent pilot ignition on automatic gas fired burner applications. A separate Flame Eye is used for monitoring the intermittent pilot. Flame Eye is wired across E_p and G. (Interrupted at 60 second point of timer).

TYPICAL DIAGRAM FOR AUTOMATIC GAS FIRED

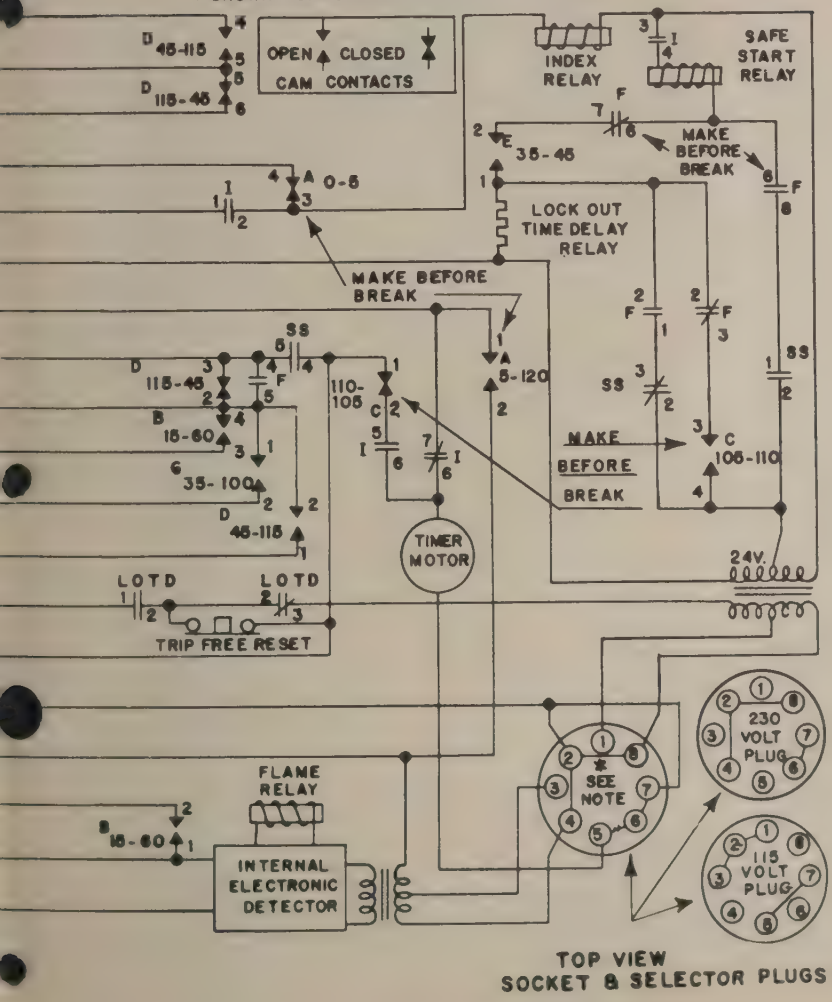


THIS DIAGRAM APPLIES TO ALL UNITS

FIG. L

BURNER WITH INTERRUPTED PILOT IGNITION

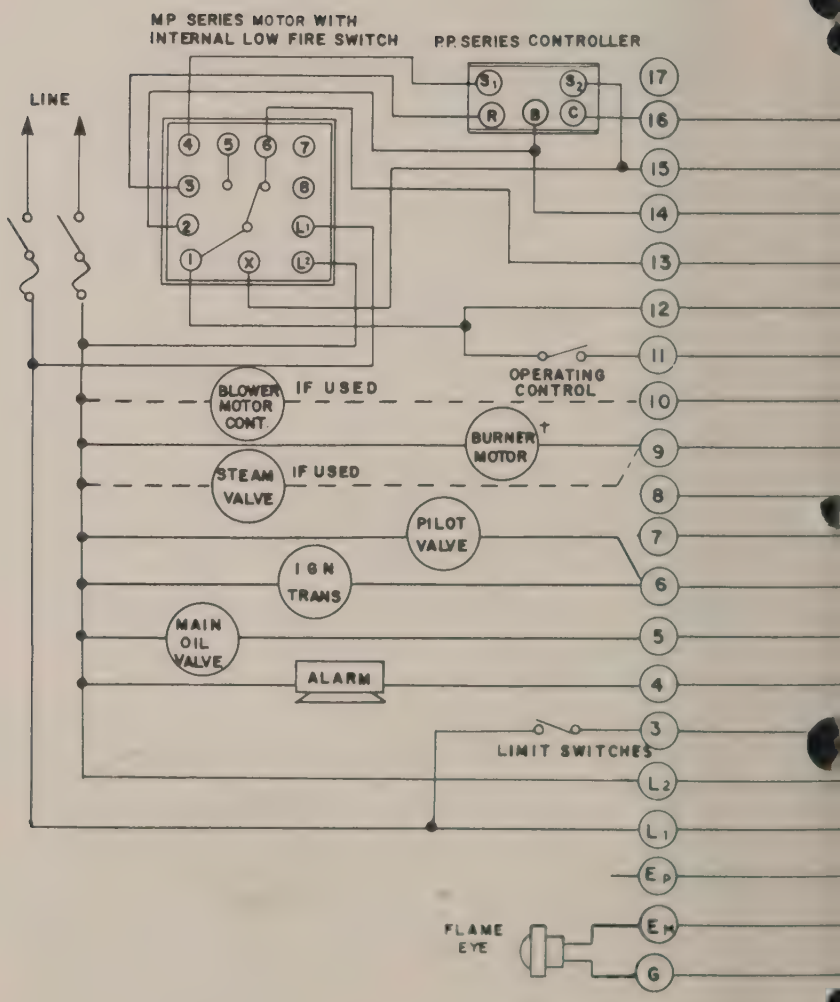
NOTES: COMPLETE TIMING CYCLE = 120 SECONDS.
TIMING LISTED AT CAM CONTACT INDICATES CLOSED CONDITION AND DURATION.
CONTACTS SHOWN AT "ZERO" TIME.
BURNER RUN POSITION = 105 SECONDS
* SHOWN CONNECTED FOR 230 VOLT LINE.



TOP VIEW
SOCKET & SELECTOR PLUGS

STARTING WITH SERIAL NUMBER 06G0001

TYPICAL DIAGRAM FOR AUTOMATIC
WITH INTERRUPTED

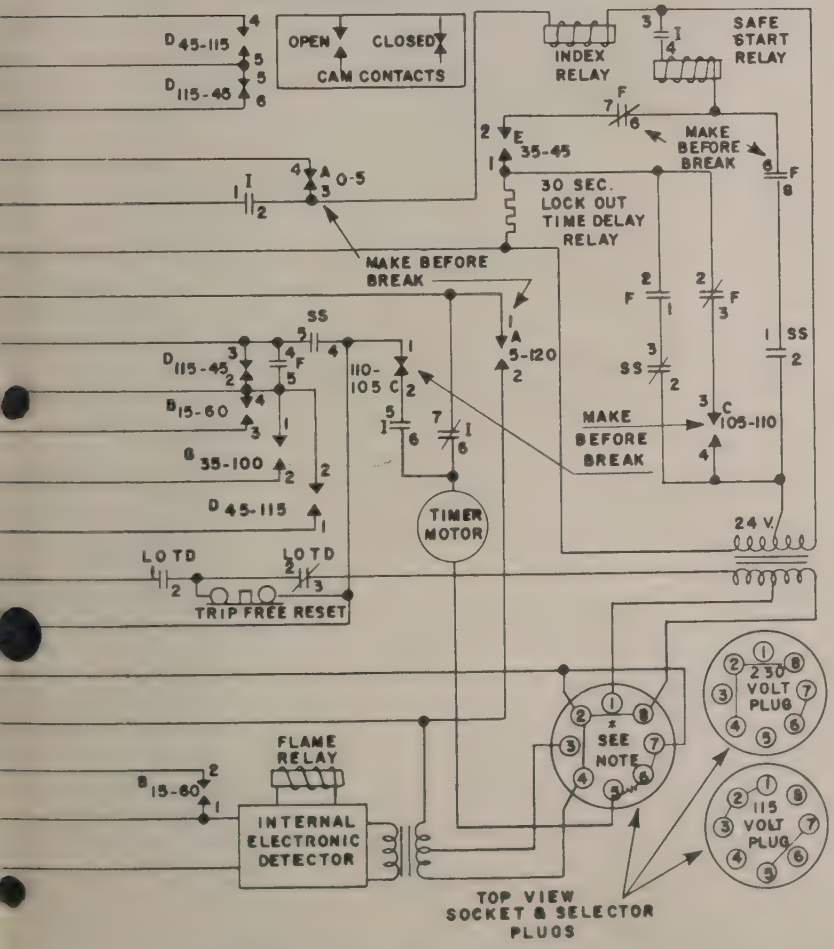


THIS DIAGRAM APPLIES TO ALL UNITS

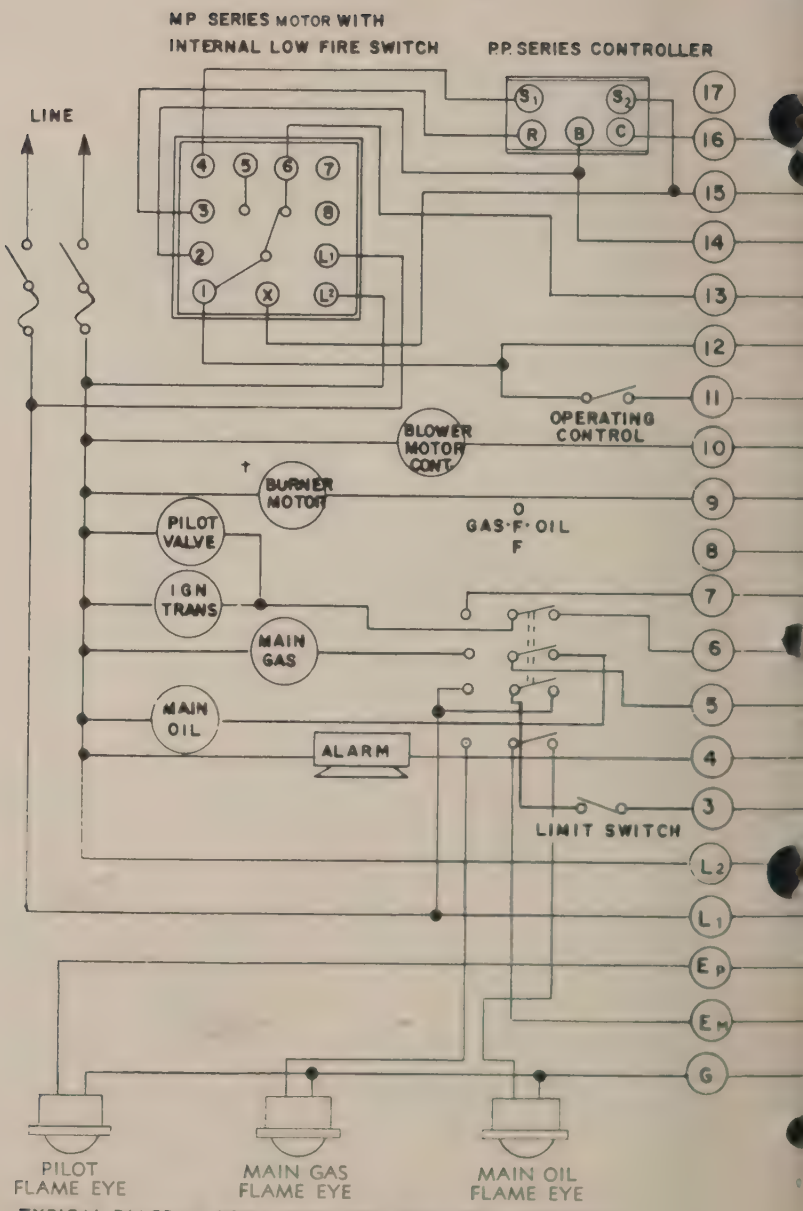
FIG. M

HEAVY OIL FIRED BURNER
PILOT IGNITION

NOTES: COMPLETE TIMING CYCLE = 120 SECONDS.
TIMING LISTED AT CAM CONTACT INDICATES CLOSED CONDITION AND DURATION.
CONTACTS SHOWN AT "ZERO" TIME.
BURNER RUN POSITION = 105 SECONDS.
* SHOWN CONNECTED FOR 230 VOLT LINE.
† CONNECT TO 10 IF NO BLOWER USED



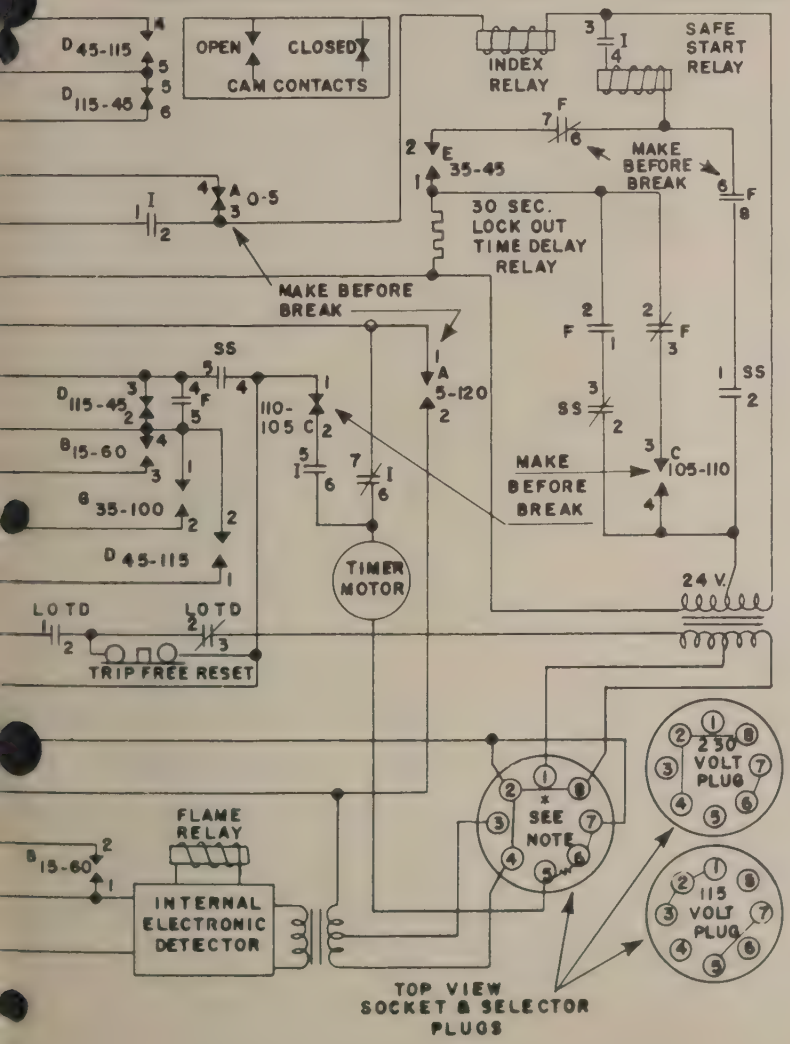
STARTING WITH SERIAL NUMBER 06G0001

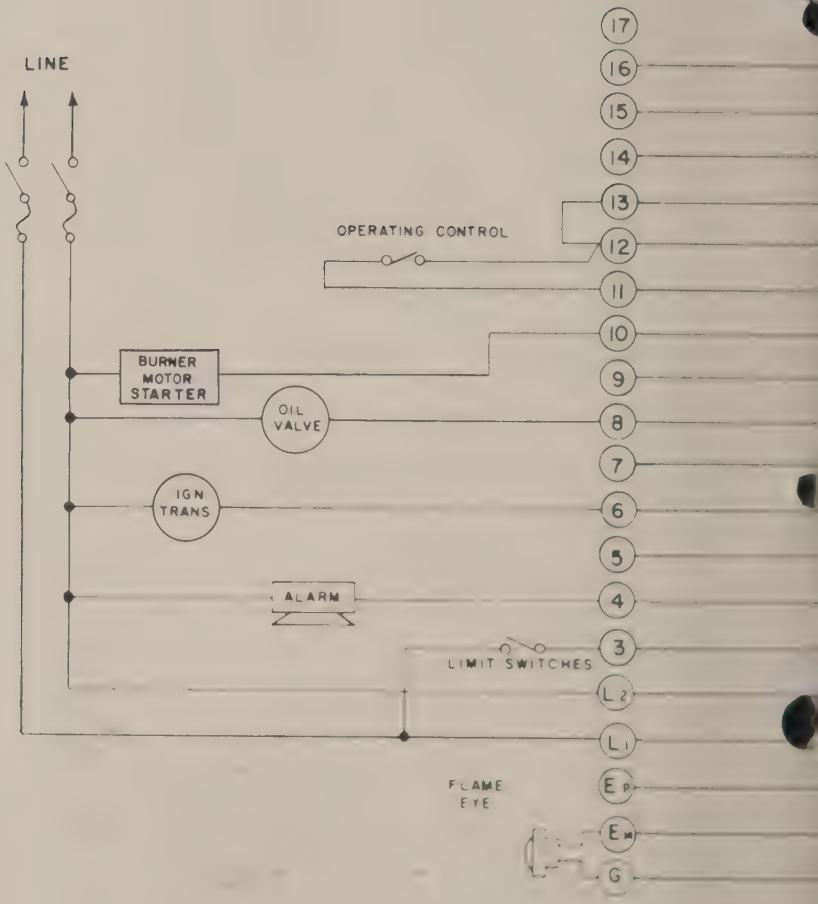


TYPICAL DIAGRAM FOR AUTOMATIC DUAL FUEL (GAS-OIL) BURNER WITH INTERRUPTED PILOT IGNITION

FIG. N

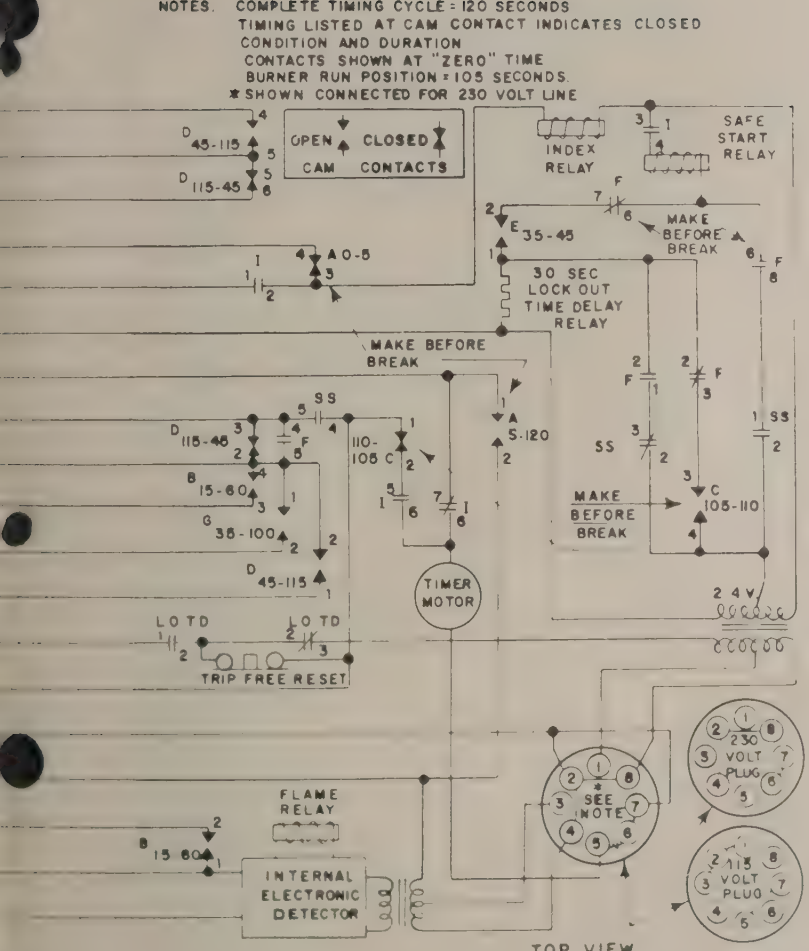
NOTES: COMPLETE TIMING CYCLE = 120 SECONDS.
TIMING LISTED AT CAM CONTACT INDICATES CLOSED CONDITION AND DURATION.
CONTACTS SHOWN AT "ZERO" TIME.
BURNER RUN POSITION = 105 SECONDS.
* SHOWN CONNECTED FOR 230 VOLT LINE.
† CONNECT TO 10 IF NO BLOWER USED

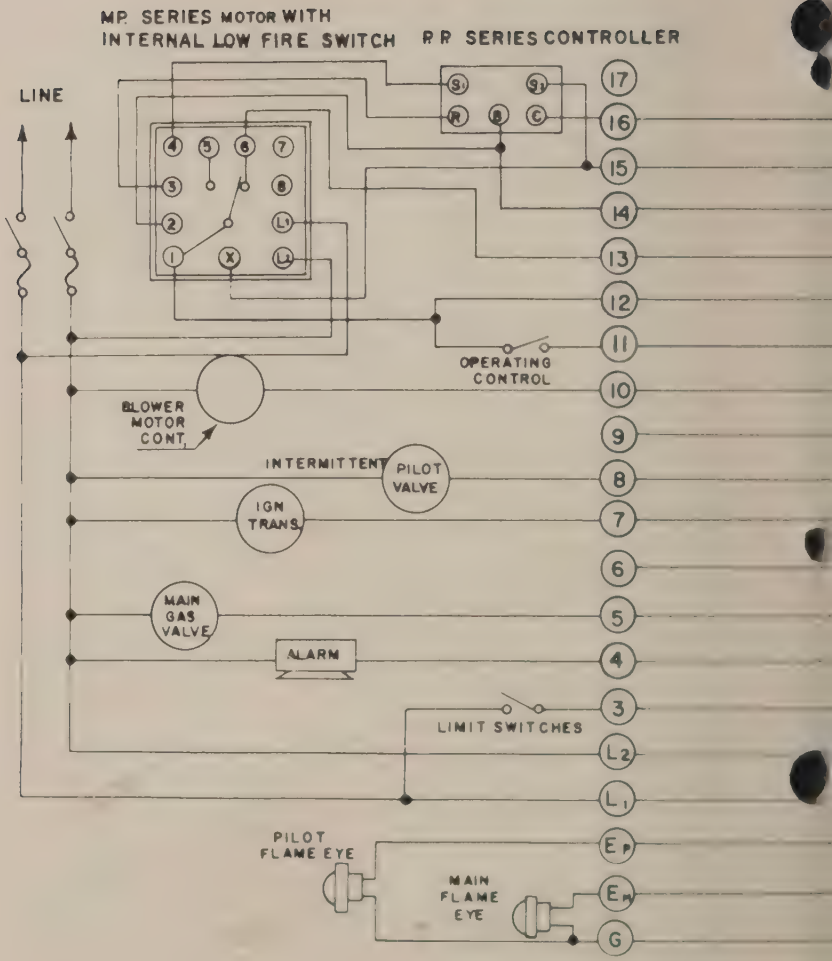




TYPICAL DIAGRAM FOR AUTOMATIC LIGHT OIL FIRED BURNER WITH DIRECT SPARK IGNITION

FIG. O

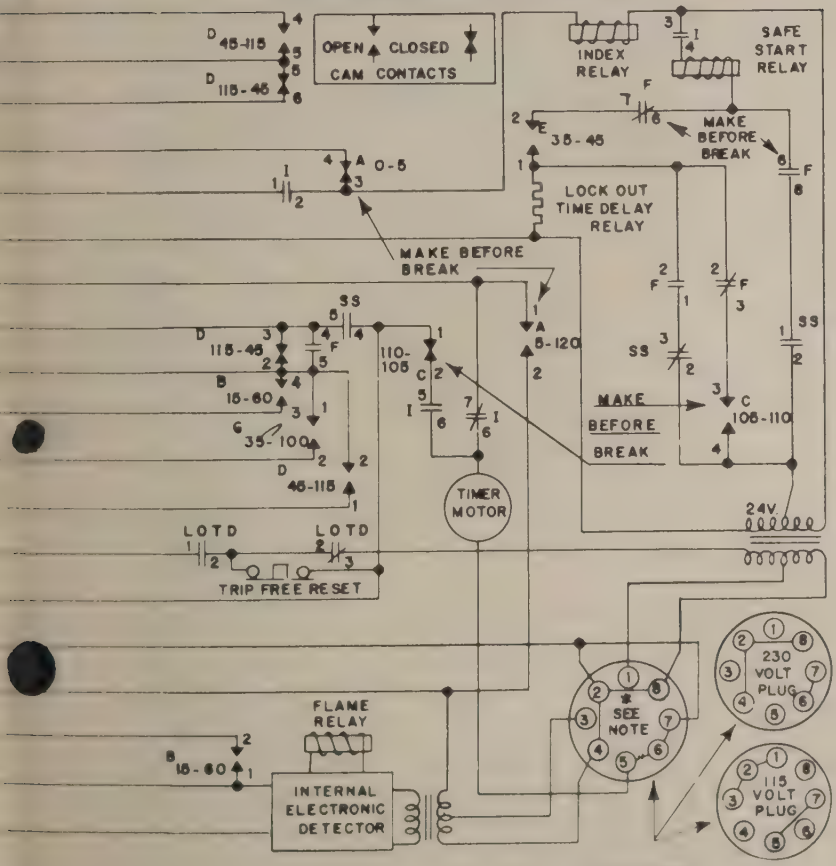

NOTES. COMPLETE TIMING CYCLE = 120 SECONDS
TIMING LISTED AT CAM CONTACT INDICATES CLOSED CONDITION AND DURATION
CONTACTS SHOWN AT "ZERO" TIME
BURNER RUN POSITION = 105 SECONDS.
* SHOWN CONNECTED FOR 230 VOLT LINE
OPEN
CLOSED
CAM CONTACTS
D 45-115
D 115-45
INDEX RELAY
SAFE START RELAY
MAKE BEFORE BREAK
E 35-45
A 0-5
30 SEC LOCK OUT TIME DELAY RELAY
MAKE BEFORE BREAK
SS
D 115-48
B 15-60
G 35-100
D 45-115
110-105 C
A 5-120
SS
MAKE BEFORE BREAK
C 105-110
TIMER MOTOR
24 V
LO TD
LO TD
TRIP FREE RESET
FLAME RELAY
B 15 60
INTERNAL ELECTRONIC DETECTOR
SEE NOTE
230 VOLT PLUG
115 VOLT PLUG
TOP VIEW
SOCKET & SELECTOR PLUGS



TYPICAL DIAGRAM FOR AUTOMATIC GAS FIRED BURNER WITH INTERMITTENT PILOT IGNITION WITH SEPARATE PILOT FLAME EYE

FIG. P

NOTES: COMPLETE TIMING CYCLE = 120 SECONDS
TIMING LISTED AT CAM CONTACT INDICATES CLOSED CONDITION AND DURATION.
CONTACTS SHOWN AT "ZERO" TIME.
BURNER RUN POSITION = 105 SECONDS
* SHOWN CONNECTED FOR 230 VOLT LINE.



TOP VIEW
SOCKET & SELECTOR PLUGS

SERVICE INFORMATION

Problems encountered in the 1574 Flame-otrol on installation may be corrected by means of a systematical checking procedure. Before beginning to trouble shoot:

A. Check the system to see if it is wired according to the diagram.
B. Check the chassis to see if it is plugged tightly into the case and that captive latches are in proper position.
C. Check voltage selector plug.
D. Press trip free lock out reset button.

1. Zero voltage at Terminals L1 and L2.
   A. Disconnect switch "OFF".
   B. Blown fuse.
   C. Broken wire.
   D. Incorrect wiring.
2. Zero voltage between L2 and 3.
   A. Open limit control in circuit.
   B. Broken wire.
   C. Incorrect wiring.
   D. Faulty limit control.
3. Flame Relay (F) in before start up.
   A. Flame-Eye wiring installed with power wiring and not in its own conduit.
   B. Flame Relay mechanically held in.
   C. Flame-Eye picking up flame from adjacent burner.
   D. Loose Flame-Eye or terminal leads.
   E. Defective tube, cell, or cell socket.
4. Timer motor not at "O".
   A. Low fire start interlock open between 12 and 13. Check by jumpering.
   B. Check for loose connection at terminals.
   C. Index relay may be held open mechanically.
5. Timer dial at "O". (Index relay does not pull in.)
   A. LOTD locked out and not reset.
   B. Modulating motor not in low fire.
   C. Operating control circuit between 11 and 12 open. Check by jumpering Terminals 11 and 12 with power on control
   D. Line voltage limit circuit open. Check by momentary jumpering of Terminals L1 and 3.
6. Timer dial between "O" and "1".
   Index relay pulled in, timer motor started, but burner or blower motor will not start.
   A. Check cam contact A 1-2.
   B. Blower or burner motor starter incorrectly wired.
   C. Tripped motor starter overloads.
   D. Insufficient voltage at blower motor.
   E. Blown motor fuse.
   F. Burned out motor starter coil.

7. Timer between 3 and 4.
   A. Safe-start relay does not pull in.
      1. Check cam contact E 2-1, I 3-4, and F 7-6.
   B. Burner motor does not start after safe-start relay has pulled in.
      1. Check to see if SS 5-4 contact is dirty.
      2. Blown motor fuse.
      3. Motor overloads tripped.
      4. Burner motor starter incorrectly wired.
   C. Terminal 8-7-6 not powered (no ignition). Safe-start Relay in.
      1. Check cam contact D 2-3.

8. Pilot Flame not established.
   A. Defective gas valve.
   B. Defective ignition transformer or electrode.
   C. Insufficient gas pressure.
   D. Improper pilot burner adjustment.
   E. Ignition assembly incorrectly wired.
   F. Cam contact B 3-4 or G 1-2 open or dirty.

9. Flame Relay does not pull in when Pilot Flame lights.
   A. Flame-Eye does not "see" Pilot Flame. Refer to page 19. Minimum pilot test, Piloted Ignition failure test.
      1. Check:
         a. Size of Pilot Flame (gas pressure must not be less than specified for the pilot burner).
         b. Flame-Eye viewing of Pilot Flame at correct angle.
   B. Flame-Eye has obstructed view of pilot.
   C. Flame-Eye lens dirty.
   D. Flame-Eye too hot.
   E. Flame-Eye incorrectly located. Sights across Pilot Flame instead of along axis.
   F. Flame relay mechanically held open.
   G. B 2-1 open or dirty.
   H. Defective scanner.
   I. Incorrect wiring of Flame-Eye.
   J. Defective tubes or cell or tubes reversed.

10. Timer dial reaches between 4 and 5. Time 45 seconds.
   A. Flame Relay has not pulled in. Pilot Flame not proven.
      1. Safe-start drops out, timer runs to 105 seconds and lockout occurs.
   B. Main flame not established. Pilot Flame proven and Flame Relay in. Refer to main flame failure test Page 19.
      1. Main fuel solenoid valve does not open.
         a. Check contact D 2-1.
      2. Defective solenoid valve.
      3. Incorrect wiring.

C. Fuel valve energized and opens, main flame does not lightoff.
   1. Inadequate pilot.
   2. Incorrect burner adjustment.
   3. Low fuel pressure.

D. Modulator does not run to demand.
   1. Modulating motor not powered.
   2. Setting of pressure controller incorrect.
   3. Incorrect wiring between modulating motor and controller.
   4. Linkage jammed.
   5. Cam contacts D 4-5 open or dirty, or D 5-6 stuck closed.

11. Main flame lights and then goes out. Dial at 6 - Time 60 seconds.
   A. Defective cell in Flame-Eye.
   B. Main Flame-Eye scanner does not see flame. (Check viewing tube.)

12. Pilot Flame does not go out. (60 second). Ignition on Terminal 7.
   A. Gas pilot valve stuck open.
   B. Check cam contact B 4-3.

12A. Pilot Flame does not go out. (100 seconds). Ignition on Terminal 6.
   A. Gas pilot valve stuck open.
   B. Check cam contact G 1-2.

13. Timer does not stop between 10 and 11.
   A. C 1-2 does not open.

14. Timer does not rotate to zero when operating or limits controls open.
   A. I 6-7 open or dirty.

15. Burner or blower motor does not stop when timer dial reaches "O". (Terminal 10).
   A. Cam contact A 1-2 stuck closed.
   B. Limit or operating switch circuit reclosed during period when timer started from 10$\frac{1}{2}$ toward zero ("O").

Warranty and Inspection Card — PLEASE FILL OUT AND RETURN

This equipment is guaranteed in accordance with the statement of warranty appearing on our quotation and acknowledgement forms. Upon receipt of this card properly filled out Warranty becomes effective. All Barber-Colman instruments are manufactured to the highest standards of quality and are carefully inspected before packing. Instruments which have been damaged or fail to operate upon installation, should be reported to the Factory at once.

BARBER-COLMAN COMPANY
Industrial Instruments Division

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